April 6, 1948. J. S. KAMBORIAN 2,438,919

METHOD OF LASTING SHOES

Original Filed Dec. 30, 1943 2 Sheets-Sheet 1

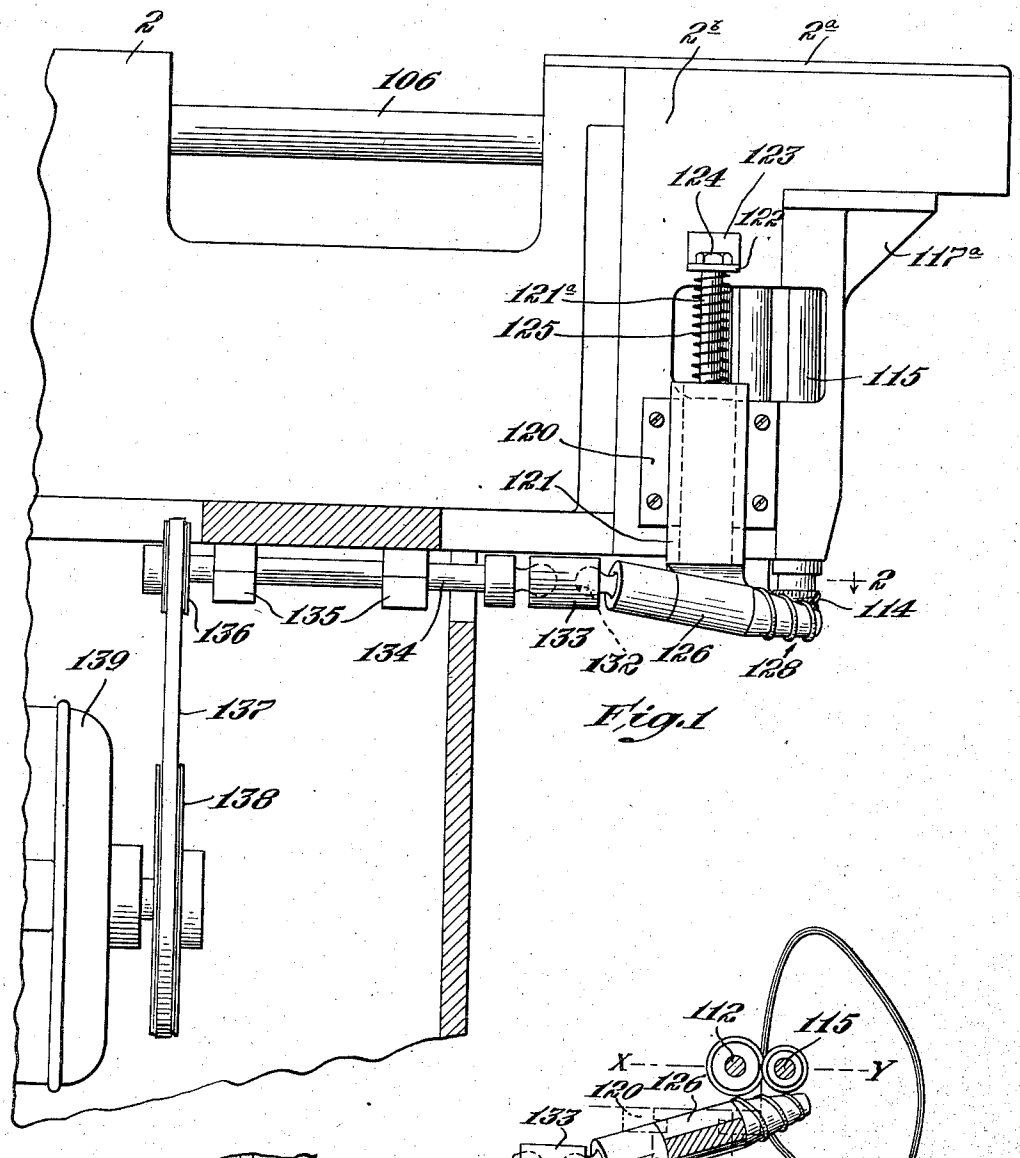


Fig. 1

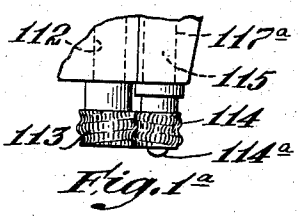


Fig. 1a

Fig. 2

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Fig. 3

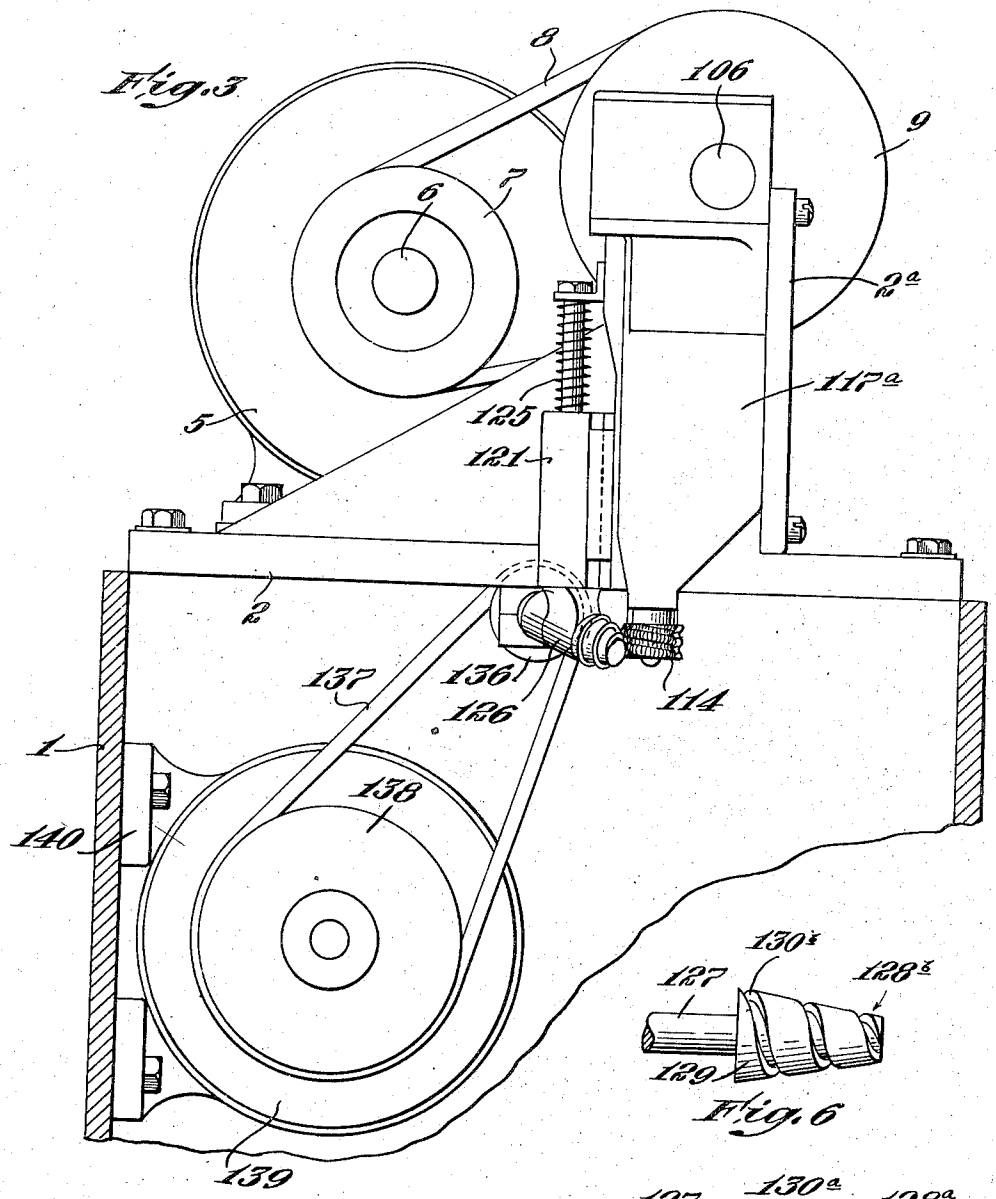


Fig. 6

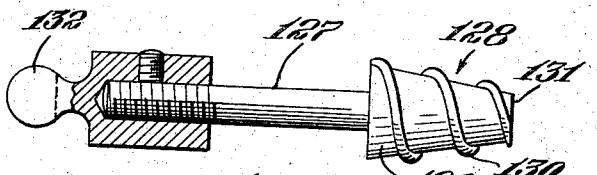


Fig. 4

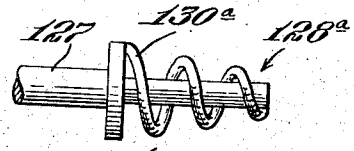


Fig. 5

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UNITED STATES PATENT OFFICE

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METHOD OF LASTING SHOES

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7 Claims. (Cl. 12—145)

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This invention pertains to the manufacture of footwear and relates more particularly to an improved method of lasting shoes or the like, the present application being filed as a division of copending application Ser. No. 516,303, filed Dec. 30, 1943.

The United States patents to Kamborian Nos. 2,251,284, August 5, 1941, and 2,254,224, September 2, 1941, respectively disclose improved apparatus for and a method of lasting shoes and suggests the employment of means, for particular instance a pair of oppositely rotating rolls, for gripping the margin of the upper while positive up-draft is exerted on the margin such as to draw the upper snugly about the last while at the same time causing the point of application of such stress to be displaced progressively along the margin of the last bottom, the marginal material being wiped in by wiping means, for specific instance a rapidly vibrating reciprocating wiper, which engages the stressed material and urges it inwardly across the edge of the insole. The United States patent to Kamborian No. 2,314,047, March 16, 1943, specifically discloses how, by holding the shoe at the proper angle, the results above described may be obtained by the use of upper gripping rolls which are not helically ribbed but this patent again suggests the employment of a vibratory wiper.

The principal object of the present invention is to provide an improved method of lasting footwear in which the underlying principle of the aforesaid Kamborian patents is utilized, that is to say, the application of lasting stress in such a way that the point of stress is progressed uninterruptedly from point to point along the periphery of the last but wherein a substantially uninterrupted in-wiping stress is also applied by a constantly rotating wiping element of such construction that it does not interfere with proper manipulation of shoes of any standard type, including those having deep shanks. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein:

Fig. 1 is a fragmentary elevation, partly in vertical section, showing the left-hand side of the machine;

Fig. 1ª is a fragmentary elevation, with certain parts omitted, showing the upper tensioning or lasting rolls;

Fig. 2 is a fragmentary horizontal section, substantially on the line 2—2 of Fig. 1, showing the

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relative positions of the lasting rolls, wiper and shoe during the last operation;

Fig. 3 is a fragmentary front elevation of the machine, partly in vertical section;

Fig. 4 is a side elevation to larger scale illustrating a preferred form of wiper;

Fig. 5 is a generally similar view showing a wiper of modified construction; and

Fig. 6 is a similar view showing another form of wiper.

The present improvements are here illustrated as embodied in a machine of the kind disclosed in the United States patent to Kamborian 2,251,285, dated August 5, 1941, to which reference may be had for details of construction not herein specifically illustrated. In the accompanying drawings the numeral 1 designates a hollow post or standard on top of which is mounted the frame 2, 2ª in which are provided bearings for most of the operative instrumentalities. Mounted on the frame 2 is an electric motor 5 having a shaft 6 carrying a grooved pulley 7 which is engaged by a belt 8 passing about a grooved pulley 9 on the horizontal shaft 106 which corresponds to the similarly numbered shaft of the Kamborian patent just above referred to. This shaft 106 has bearings in the main frame 2 and in the forward portion 2ª of the frame. This latter portion of the frame overhangs the front wall of the post 1 (as shown in Fig. 1) so as to present the lasting instrumentalities in proper position for engagement with the shoe while affording sufficient clearance between the post and the shoe which is being lasted.

Adjacent to its forward bearing the shaft 106 is provided with a worm (not shown) which meshes with a worm wheel on a vertical shaft (not shown) turning in fixed bearings and provided with a pinion which meshes with a similar pinion secured to the upper end of a vertical shaft 112 (Fig. 1ª) mounted in suitable bearings and provided at its lower end with the work-gripping lasting roll 113 which is preferably provided with a helical peripheral rib. Cooperating with the roll 113 is a roll 114 preferably of somewhat smaller diameter than the roll 113 and also preferably furnished with a helical peripheral rib. Preferably, although not necessarily, the lower end of the roll 114 is furnished with a rounded or substantially hemispherical boss 114ª designed to engage the bottom of the insole of the shoe during the lasting operation, thereby to resist upward stress of the lasting rolls.

The rolls 113 and 114 grip the margin of the shoe upper, and as they turn in opposite direc-

tions, they feed the work along uninterruptedly while it is being subjected to the up-draft or lasting pull. By making the roll 114 of somewhat smaller diameter than the roll 113 the lasting of the shank and toe portions of the shoe is facilitated.

The roll 114 is fixed to the lower end of a shaft 115 to the upper end of which is secured a worm (not shown) which is always in mesh with the aforementioned worm carried by the shaft 106. However, the shaft 115 is mounted in bearings carried by a movable slide member 117a which comprises an elongate horizontal portion arranged to slide in guideways within the post or standard 2 and which is constantly urged rearwardly by springs (not shown), thus tending to cause the rolls 113 and 114 to approach. On the other hand the rolls may be moved apart to facilitate introduction of the upper material between them by depressing a treadle (not shown) where motion is suitably transmitted to the slide member 117a so that depression of the treadle causes the slide member to move to the right (Fig. 1) thereby separating the rolls 113 and 114 to facilitate introduction of the margin of the upper between them.

In accordance with the present invention, the vibratory wiper of Patent 2,251,285 and the means for operating it are omitted and replaced by a novel rotary wiper. Referring to Figs. 1 and 3, the forward face 2b of the frame member 2a is provided with guide brackets 120 furnishing a vertically elongate guideway for the reception of a bearing-supporting slide 121. This slide is provided with an upwardly extending tail portion or stem 121a which passes through an opening in a horizontal shelf 122 forming part of a bracket 123, secured to the frame, the stem 121a having a threaded end engaged by a nut 124 which limits downward movement of the bearing support 121. A coiled spring 125 embracing the stem 121a urges the bearing support downwardly. At its lower end the bearing support 121 carries a bearing sleeve 126 whose axis, as illustrated in Fig. 2, is inclined in the horizontal plane at an angle of the order of 20° to the vertical plane X—Y of the axes of the shafts 112 and 115. The axis of the bearing 126 is also preferably normally inclined to the horizontal as shown in Fig. 1.

The rotary wiper 128 (Fig. 4) comprises the journal portion 127 arranged to turn freely in the bearing sleeve 126 and has mounted on its forward end a truncated conical roll 129 provided with a helical peripheral rib or screw thread 130. The rotary wiper 128 of which the rib or screw thread 130 is the active wiping element, tapers from its rear end toward its forward end and inclines downwardly and forwardly. Since the shaft 127 is mounted in the vertically slidable bearing support 121 it is possible for the wiper 128 to move upwardly in opposition to the spring 125 in response to pressure of the work beneath it.

The shaft 127 is furnished at its rear end with a spherical knob 132 which is seated in the forward end of a socket 133 and pivotally united to the latter. The rear end of the socket 133 is similarly connected to a knob projecting from the forward end of a shaft 134. The sleeve 133 and the knobs provide a conventional universal joint by means of which the shaft 127 may be driven regardless of the position of the bearing 126. The shaft 134 (Fig. 1) turns in bearings 135 secured to the under side of the frame 2, the shaft being provided with a pulley 136 which is engaged by the drive belt 137 embracing the pulley

138 on the shaft of a motor 139 having a base 140 (Fig. 3) which is secured to the inner vertical surface of the hollow post 1. The motor 139, together with the drive connections between it and the shaft 127, is designed to rotate the shaft 127 at high speed, for example a speed of the order of 1800 revolutions per minute.

In the operation of the machine and assuming that the motors 5 and 139 are supplied with current and that the shafts 106 and 134 are rotating in the proper direction, the operator depresses the treadle thereby moving the rolls 113 and 114 apart and introduces the margin of the shoe upper between them. While such operation of the rolls is convenient, skilled operators may find it possible to introduce the upper material between the rolls without manipulation of the treadle. The operation of the rolls 113 and 114 in uninterruptedly progressing the work while the marginal material of the upper is being subjected to lasting stress or up-draft is identical with that of the corresponding rolls of the aforementioned Kamborian patents. As the material is uninterruptedly progressed by the rolls, the helical rib 130 of the wiper 128 progressively forces the stressed material inwardly over the edge of the insole just as the material is released from the grip of the rolls. The normal position of the forward end, at least, of that point of the wiper rib or screw thread which operatively engages the work at any given time, is below the horizontal plane of the lower end of the work-positioning boss 114a. Thus when the operator presses the surface of the sole member upwardly against the boss 114a, the rib or screw thread is forced firmly into the substance of the nearly upright portion of the marginal material where the latter is just being released from the bite of the rolls. The helical rib or screw thread thus partially embeds itself in the upper material so that it is capable of exerting a smooth inwardly directed and uninterrupted screw thrust for inwiping the margin. By reason of the helical form of the wiper element, the in-wiping is a progressive operation, the helical rib engaging and at least partially embedding itself in the material and gradually propelling it inwardly by a smooth uninterrupted screw thrust without at any time disengaging it or relieving the pressure upon it so that there is no chance for the material to retract. It is thus laid smoothly and firmly down against the insole under substantially the full tension imparted while it was gripped by the rolls 113 and 114. It may be remarked at this point that the tensioning of the upper material may be varied by manipulation of the shoe while the upper is gripped by the rolls, as by causing the bottom of the last to be inclined substantially with respect to the plane of the lower ends of the rolls. This up-drawing action may be accomplished by the use of rolls unprovided with helical ribs as more particularly suggested in the Kamborian Patent No. 2,314,047.

In accordance with the present invention not only is the up-drawing of the margin of the upper a progressive operation in which the point of stress moves uninterruptedly along the margin of the insole, but the in-wiping is also of a similar progressive character in the nature of a smooth uninterrupted screw thrust by means of which uniform inwiping pressure is exerted upon the margin, quite different from that occasioned by the employment of a reciprocating wiper such as that of the previously mentioned Kamborian patents.

Since the rotary wiper 128 as herein disclosed

wipes in the marginal material by the application of force applied axially of the wiper and since the wiper is of truncated conical form, quite small at its inner end, for example tapering from a character of five-eighths inch at its larger end to a diameter of the order of three-eighths inch, at its smaller end, it is readily possible with this apparatus to last shoes of all types, even those having very deep shanks, since the presence of the wiper does not interfere with the proper manipulation of the shoe. Obviously, the dimensions of the wiper may be varied if desired from those here suggested.

Since the wiper is urged downwardly with substantial force by the spring 125 and since it must be lifted by upward pressure of the work against it in order properly to engage the margin of the upper between the rolls, the wiper is always applying substantially constant and uninterrupted and unvarying pressure, during operation, toward the shoe bottom and thus irons the inwiped materials firmly down into secure adhesive engagement with the inner sole.

While the wiper shown in Fig. 4 is preferred, it is contemplated that a wiper 128a such as shown in Fig. 5 may be employed, the latter being of skeleton form, omitting the solid supporting roll 29 of the wiper 128 and merely employing an open rigid helix or screw thread 130a as the wiping element. This rigid helix may consist of a length of smoothly polished rigid wire secured at its opposite ends to the shaft 127. In Fig. 6 a still further type of wiper is illustrated wherein the roll 129b is furnished with a helical groove 130b instead of a helical projecting rib.

While wipers such as shown in Figs. 5 and 6 are contemplated as useful for the purpose and while the wiper 128 of Fig. 4 is a preferred construction, it is contemplated that wipers of other specific constructions may be employed within the scope of the present invention providing they are designed to affect progressive in-wiping action such as is obtained by the employment of the specifically illustrated wipers.

It may be noted that in the operation of the wiper here disclosed the application of stress to the tensioned upper always takes place at a point in the helical rib and that the direction of effective in-wiping stress is always substantially parallel to the axis of the helix. It is further to be noted that the axis of the helix lies in a plane which transects the bottom of the shoe and that, when in action, the lowermost or work-contacting element of the helix or of the supporting roll 129 is substantially parallel to the surface of the insole. It is also to be noted that as the shoe is moved relatively to the rolls, the axis of the helix is progressively shifted by infinitesimal amounts along the periphery of the last bottom concomitantly with the similar shift of the position of the plane X—Y (Fig. 2) along the periphery of the last bottom.

When herein reference is made to the progress of the gripping means or wiper along the edge of the last bottom, it is to be understood that relative motion is intended since ordinarily the shoe is moved while the gripping rolls and wiping means remain in the same position in space.

In the description and appended claims the term "upper" has been used in a broad sense and is intended to be inclusive of such elements as the wrapper portion of a so-called "California style" or "platform" shoe. Moreover, the term "insole" is to be considered as broadly inclusive of the middle sole, platform or cushion element of such a platform shoe.

While certain desirable embodiments of the invention have herein been illustrated by way of example it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claims.

I claim:

1. That method of lasting a shoe which comprises as steps applying up-drafting stress to a narrow area of the margin of the upper, thereby to draw the upper snugly about the last, shifting the point of application of such up-drafting stress uninterruptedly along the margin in such a way that as a fresh area of the margin is subjected to such stress an area just previously subjected to stress is relieved of such stress, and wiping each successive area of the margin, as the up-drafting stress is being released therefrom, inwardly across the edge of the last bottom by a smooth uninterrupted screw thrust whose point of application to the margin is constantly and progressively shifted without intermission at the same rate that the point of application of in-wiping stress is shifted so as always to remain at the same distance from the point of application of up-drafting stress.

2. Method of lasting shoes which comprises as steps seizing an area of the margin of the shoe upper, applying lasting pull thereto such as to stretch the upper snugly about the last, progressively shifting the point of application of such pull relatively to the last by infinitesimal amounts along the periphery of the last bottom in such a way that as fresh portions of the margin are subjected to pull, the stress on the previously stretched portion is released, and engaging a rotating helical wiping element with the material as the stress is being released therefrom, thereby to urge the material inwardly across the edge of the last by a smooth, uninterrupted screw thrust whose point of application to the margin is constantly and progressively shifted without intermission along the edge of the last bottom while maintaining said point of application always at the same distance from the point of application of lasting pull.

3. That method of stressing flexible material and wiping it in over the surface of a substantially rigid part which comprises as steps applying tensioning stress to a narrow area of the flexible material in a direction substantially perpendicular to said surface of the rigid part, shifting the point of application of such stress uninterruptedly along the edge of said surface in such a way that a fresh area of the flexible material is subjected to stress concomitantly with the release of stress from the area just previously subjected to stress, and urging the material from which stress is being released inwardly across the edge of said surface and into contact with said surface by a smooth, uninterrupted screw thrust whose point of application to the flexible material is constantly and progressively shifted without intermission along said edge so as always to remain at the same distance from the point of application of the tensioning stress.

4. That method of lasting shoes which comprises as steps causing gripping means to seize a narrow area of the margin of the shoe upper and to hold the margin while up-drawing stress is applied to the upper, thereby to draw the upper snugly about the last, shifting the place of application of such up-drawing stress uninterruptedly along the margin in such a way that as a fresh

area of the margin is subjected to up-drawing stress an area just previously subjected to stress is relieved of such stress, causing a rotary wiper element having a helical work-engaging member to contact that portion of the margin which is just escaping from the gripping means, rotating the wiping element about an axis which extends transversely of the edge of the last and while keeping its helical work-engaging member constantly pressed against said margin so that it exerts an in-wiping stress, constantly and progressively shifting the place of application of such in-wiping stress without intermission at the same rate that the place of application of up-drawing stress is shifted thereby always to maintain the place of engagement of the helical work-engaging member with the margin at the same distance from the gripping means.

5. That method of lasting shoes which comprises as steps causing gripping elements to seize a narrow area of the margin of a shoe upper and to hold it while up-drafting stress is applied, thereby to draw the upper snugly about the last, one at least of the gripping elements being a rotating roll, uninterruptedly shifting the place of application of such up-drafting stress along the margin so as progressively to grip fresh portions of the margin while concomitantly releasing portions previously gripped, engaging a wiping element, comprising a helical work-engaging rib, with that portion of the upper margin which is being released at any given time by the gripping elements, rotating said wiping element while maintaining a substantially constant uninterrupted pressure of its helical rib against the marginal material while constantly and progressively shifting the place of application of such pressure without intermission along the edge of the last in a direction transverse of the axis of said wiping element while maintaining said place of application of pressure always substantially at the same distance from the place of application of up-drafting stress.

6. That method of lasting shoes which comprises as steps, causing a pair of oppositely rotating rolls to seize between them a narrow area of the margin of the shoe upper and to hold it while up-drafting stress is applied thereby to draw the upper snugly about the last, uninterruptedly rotating the rolls thereby to shift the place of their engagement with the work along the edge of the last, the rolls progressively seizing fresh areas of the lasting margin while concomitantly releasing

the areas previously gripped, applying to that area of the upper which at any given time is being released from the grip of the rolls an in-wiping thrust directed transversely across the edge of the last by means of a rotating helical wiping element whose axis always makes the same angle of orientation with the plane of the axes of the rolls, uninterruptedly rotating the wiping element always in a direction to urge the marginal material inwardly across the edge of the last bottom, and shifting the place of application of said in-wiping thrust uninterruptedly along the edge of the last so as progressively to wipe in fresh areas of the marginal material while keeping the place of engagement of the wiping element with the work always at substantially the same distance from the place of application of up-drafting stress.

7. That method of lasting a shoe which comprises as steps applying up-drafting stress to a narrow area of the margin of the upper, thereby to draw the upper snugly about the last, shifting the point of application of such up-drafting stress uninterruptedly along the margin in such a way that as a fresh area of the margin is subjected to such stress an area just previously subjected to stress is relieved of such stress, and subjecting each area of the margin as the updrafting stress is being released therefrom to a smooth uninterrupted inwardly directed screw thrust applied by means of a rotating, tapering, helical wiping element, which partially embeds itself in the marginal material, keeping the axis of said element always transverse to the edge of the last, and constantly rotating said helical element while concomitantly relatively shifting the axis of said element and the last so that the point of engagement of said helical element with the marginal material moves uninterruptedly along the edge of the last bottom.

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